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MAMMOTH CAVE, KENTUCKY.

A Lecture delivered before the American Geographical Society.

BY

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Modern voyages and travels have been pushed with such vigor as to reach nearly every nook and corner of our planet. Yet these researches have been mainly superficial in the sense that they have been limited to the surface of the globe. You are now invited to visit a region below the surface; a sunless realm that has, however, its mountains, plains and valleys, its lakes, rivers and cascades, its unique and extensive fauna and flora, and that claims a degree of attention not yet accorded to it by scientific men. While something has been done by individual enterprise, and in connection with state surveys, it yet remains for our geologists and geographers, by a system of thorough exploration, to take possession of under-ground America. It is estimated that the subterranean windings underlying the Ohio valley alone would, if put end to end, make a passage-way of 100,000 miles—a tunnel long enough to go four times around the globe. The region thus honey-combed in the single State of Kentucky exceeds 8,000 square miles. There are said to be 500 open caverns in Edmondson County, of which Mammoth Cave, now to be particularly described, is but a noble specimen.

The region shows few traces of dynamic disturbance, but its rocks have been carved in every conceivable manner by the chemical and mechanical action of water. Jutting crags at the head of ravines form what are known as "rock houses," or "rock castles," and that are highly picturesque, but seldom have any great depth. These ravines are usually dry in summer, though flooded in winter. The general absence of running streams has caused this portion of Kentucky to be called "The Barrens." The torrents formed in the rainy season cut their way through the strata down to the drainage level, and re-appear as perennial springs, often feeding rivers of considerable size. Green River is such a stream. It drains Mammoth Cave, as well as many other caves. Its waters never freeze, even in the coldest weather ; and being navigable for a considerable part of its course, it furnishes a winter harbor for steamboats and other craft, when the Ohio River, into which it empties, is either ice-bound or clogged by drifting ice from the northern valleys.

One who strolls along the margin of Green River will observe at intervals arches, or it may be mere rude gashes, in the bluffs. Now and then these openings can be entered, though usually they cannot be explored very far. Could this be done we should find a succession of tiers, or galleries, by which we might make our way, from stage to stage, amid surprising and magnificent rooms, until at length, we should emerge into an oval valley, around which may lie a cultivated field, or more probably a tangled thicket. These are sink-holes, natural traps, into whose jaws, in modern times, hogs and cattle have disappeared ; just as in an-

cient times elk, bear and bison were entombed. Sink-holes near habitations have usually been stopped up, thus being transformed into ponds. The enthusiastic cave-hunter enjoys being let down by a rope through a sink-hole, if practicable, and then wandering on lamp in hand, through wonderful apartments where no human foot ever trod before. But the more safe mode of entrance usually is at a point where the cavern roof has broken through, the fragments forming stepping stones.

Mammoth Cave is in latitude $37^{\circ} 14'$ N., and longitude $86^{\circ} 12'$ W. It is midway between Louisville and Nashville, and may be reached by railroad. The environs are wild and rocky, abounding in game. Hence the legend is credible that the great cave was discovered by a hunter, named Hutchins, who in 1809, followed a wounded bear into its grim fastnesses. The cars now land us near the Mammoth Cave hotel, which is itself an architectural curiosity. The original cabin, as built in 1812, still stands intact, except that its logs are weather-boarded, and its masonry is hidden by masses of ivy. The log cabins were increased in number, as visitors multiplied, and to meet their demands a main edifice has been built with offices, parlors, ballroom, etc., which has been nearly doubled in size during the past year; while the cabins themselves stand as at first, except that they are connected by a long and delightful veranda. On entering the office we meet with a hearty welcome from Manager Ganter, and register our names with thousands of others who have come hither from all parts of the known world. The majority however are from the Southern States, and he who wishes

to see the best types of Southern society will be gratified here.

Loitering amid the long colonnade, by whose tall, white pillars the breeze floats in from a grove of aged oaks and across a blue-grass lawn, we find the very atmosphere redolent of romantic associations. How many thousands of tourists and savants have met here to gratify their curiosity concerning one of the wonders of the world. Guide-books can be had at the office, together with a map of the cave, both prepared by the author of this lecture for the convenience of visitors, and which, though far from perfect, give some idea of the intricacy of the subterranean windings. The areal diameter cannot exceed ten miles ; but the labyrinthine mazes are supposed by the best authorities to exceed 150 miles in all. The ordinary tourist seldom sees more than a comparatively small portion of this vast realm. Two principal routes have been marked out : the Short Route, covering about seven miles of underground travel, and requiring about four hours ; and the Long Route, taking nine hours and covering perhaps sixteen miles. Special trips are also arranged for those who wish to take them. My object in this lecture will be to conduct the audience over these regular trips, with perhaps an occasional digression. The regulation hours for entering the cave are 10 A. M. and 7 P. M. Moderate fees are charged, three dollars for the Long Route, two for the Short Route, and one each for the Special Routes.

Guides are autocrats here, and our safety depends on our obedience to their directions. Stephen and Matt, favorites with an entire generation of cave hunters,

rest from their labors. Their places are filled by William, Nicholas, Eddie, and others, black, white and mixed, who stand ready to enlighten us by scraps of wisdom and flashes of wit original and selected.*

Accoutred as we please we saunter down the forest glen and across a rustic bridge, to a rocky platform some 300 yards from the hotel, and 194 feet above the level of Green River. A geological section shows that the Chester sandstone forms the crest of the bluff, under which are strata of Saint Louis limestone, that have been excavated to the depth of 328 feet, though the horizontal tunnelling has extended for a great many miles.

The mercury may have marked 100° in the shade when we began our walk; but at the cave's mouth it falls to 66°. Lift your hand and you will find the fervid heat again. The cold current may be felt for a long distance before it commingles with the ordinary atmosphere. But when, as is the case in winter, the exterior temperature is lower than the interior, the current is reversed. The cave seems thus to breathe in and out, as if the mighty lungs of the earth were inhaling and exhaling the vital air—a phenomenon that caused the

*This lecture, as delivered, was profusely illustrated, and I regret that the pictures cannot be reproduced here. Mention, however, should be made of my artists. Mr. J. Barton Smith took the sketches used in my guide-book and magazine articles. The pioneer of subterranean photography was Mr. Charles Waldack, of Cincinnati. Since his day, Messrs. Thumb, Sesser, Farini, Darnall, and especially Ben Hains, have done work to be proud of when the intrinsic difficulties of their task are considered. I may add that my materials for the lecture itself were obtained during repeated trips through Kentucky, and have to some extent been already treated by me in descriptive narrations that may have fallen under the reader's eye. But in using them for the present occasion they have been carefully revised and corrected by recent observations, and important additions have also been made, now published for the first time.

Greeks to give the name of Antron to such openings, meaning a breathing-place.

Mammoth Cave has a noble vestibule! Amid tulip trees and grape-vines, maples and butternuts, fringing ferns and green mosses is the gateway which the fingers of a rippling rill made ages ago by prying the rocks apart. The rill still runs and leaps fifty feet to the rocks below. As we descend the seventy steps of solid stone, winding around the cascade, we find that the air grows cooler still, till it has fallen to 54° Fahr., which is the uniform temperature winter and summer, year after year. This fact I determined after taking one hundred and fifty temperature observations in different rooms, pits and avenues, with the best instruments to be had from the Kew and Winchester observatories. In determining the temperature of the vast apartments of such a cavern we have doubtless ascertained the mean temperature of the crust of the earth, at least for that latitude. This conclusion has been since confirmed by repeated observations in other caves and grottoes of the Western States.

Having traversed a roomy ante-chamber we pause at an iron gate put there to prevent spoliation, illegal surveys and the intrusion of non-paying visitors. The guide unlocks the gate, and we take our last look at the dim daylight that struggles in between the bars. As the breeze we had noticed at first dies away, we light our lamps, feeling that it would be a serious matter to be lost in so vast a domain of darkness.

Old Jack, the house-dog, used to think so, too, and would accompany visitors no further than the gate, where he would peer into the mysterious darkness, and

then plod along home. But Jack had a companion in his old age, a frisky young puppy that knew no fear and never had a solemn thought. The latter would boldly follow us to the remotest bounds of the cavern. On one occasion he went with Professor Brewer and myself to the regions beyond the rivers, where he got lost. We set a lamp for him at Echo River and returned to the hotel. The next morning on going in we found him sitting by the lamp patiently waiting for us. But no sooner had we ferried him over than he ran away again. He was missing till the second morning, when on opening the cave the guides found the two dogs on opposite sides of the iron bars exchanging experiences. We traced the path that had been taken by the runaway, led by instinct where no human being would have dared to go alone and in the darkness of perpetual midnight. That dog had floundered through mud-banks, swum rivers, threaded intricate passages, always taking the short-cut, with no other guide than his mysterious gift of orientation—the same sense that pilots homing pigeons on their aerial voyages. By contrast with this perfect and fearless operation of instinct, the story may be told of old Matt's escape under similar circumstances. The colored guide named was at work near the pits when he heard some young fellows approaching with song and shout, as if slightly inebriated. The ex-slave thought that "discretion was the better part of valor," and hid in a crevice, put his lamp out, and quietly waited for the revellers to pass by. On coming forth from his hiding-place he found that he had no matches. The hour was late and he determined to grope his way out. Suddenly his staff dropped into a pit of unknown

depth. The brave guide swooned on the edge of the chasm. On coming to, he collected his wits and felt for the path with his hand, finally making his way to the surface. But it was an adventure that he could never tell of without a shudder.

Whatever route one takes will lead for some distance through the main cave—the great trunk from which all avenues diverge. As we proceed we are surprised to find ourselves following a well-worn cart road that presently enters a spacious rotunda. On our right are three huge vats, and a tall frame near by that once supported a large pump, but is now utilized for holding our superfluous wraps. These are relics of the old saltpetre works that have historic interest. The pioneers who followed in the wake of Daniel Boone were thrown on their own resources in all respects. The importation of gunpowder was attended with expense and difficulty. Hence, they sent out such strolling chemists as happened to be among them, to hunt for nitre-beds. One of these, Dr. Samuel Brown, of Lexington, Ky., made a journey of a thousand miles on horseback, in 1806, in order to inform the American Philosophical Society that the caves of Kentucky were rich in saltpetre. The statement made by this ardent patriot was remembered when the War of 1812 was waged with Great Britain. Other sources then being cut off, the Government, throughout that sanguinary conflict, was dependent on the miners of the Ohio Valley for the means of making gunpowder wherewith to repel the invaders.

The process of manufacture was as follows: The nitrous earth was carted out from various avenues in

hoppers where cold water, conveyed by wooden pipes, was poured over each charge, whence, in a day or two, a strong solution of the salts would run into the vats already mentioned. From the vats the liquor was pumped into a second set of pipes so tilted as to let it flow out of the cave, to be boiled and afterwards cooled in crystalization troughs. When ready for transportation, the crystals were carried on pack-mules across the mountains to the sea-board and put to a practical use. The business was carried on by the firm of Gratz and Wilkins, whose agent, Mr. Archibald Miller, declared that this one cave alone could supply the whole world with saltpetre. The contract for 1814 netted the managers \$20,000. When the war ended the demand fell off, so that the manufacture was stopped and has not since been resumed. We get an idea of what was done by the mountains of lixiviated earth cast up on both sides of the old cart-road, and that is now almost as hard as stone.

The stalls are still exhibited where the oxen were tied and fed, their halters being made fast by means of cavities called "pigeon-holes," and that were worn smooth by frequent use. The old ruts are remarkably preserved, as well as the prints of the ox-hoofs made more than eighty years ago. Those miners led rough lives, but did thorough work, upturning every stone where they thought there might be any "petre-dirt," as they called the nitrous earth. And when the Sabbath came they kept it as a day of rest, and were accustomed to gather in the rock chapel, bearing the name of the Methodist Church, where the logs are in place that served them as benches. Now and then a sermon is preached from this ancient and historical natural pulpit.

A trustworthy legend is connected with the family of Mr. Gratz, an early owner of the cave. He was of Hebrew stock, and had a charming daughter, Rebecca, with whom Washington Irving had a pleasant acquaintance. On a visit to Sir Walter Scott, Mr. Irving told the "Wizard of the North" about her; and thus, as we are assured, the pretty Kentucky Jewess, Rebecca Gratz, became the model of the renowned Rebecca of *Ivanhoe*.

Another legend is to the effect that when Audubon, the ornithologist, visited Rafinesque, in his Kentucky cabin, he caught a remarkable bat by knocking it down with the eccentric Frenchman's violin. Rafinesque had his revenge by naming the series of rooms where myriads of bats hybernate, Audubon Avenue. It used to be called Bat Avenue. At its entrance two skeletons were exhumed by the miners, one of a child, and the other of a giant. This fact seems to be well substantiated.

No one can tell what surprises may be sprung upon a cave-man. There is a place near the end of Audubon Avenue, in the so-called Little Bat Room, where a narrow crevice opens into a pit. The miners had an idea that it must be very rich in nitrous earth. One of them in making an examination dropped his lamp down this crevice. He climbed down a little way into the ugly black hole and felt for his lamp with a stick. The stick itself, however, slipped from his grasp and went rattling down into an abyss. The lamp was a simple affair. But as it could not be replaced without a journey of nearly 200 miles, its loss was a serious matter. Accordingly a sprightly young negro was let down by a rope, as a sort

of animated plummet to gauge the depth of the pit. He failed to recover the lamp ; but he described such a magnificent underground temple that the report was current for a generation that the lad had lost his wits. Thirty years later Matt, the guide, made his way from another direction into what is now called the Egyptian Temple, and there came across both lamp and staff lying near its splendid columns. There are six of these in all, averaging eighty feet in height and twenty-five feet in diameter. They stand in a semi-circle flanked by pyramidal towers. The material is gray oolite, fluted by deep furrows, and veneered with yellow stalagmite, rich as jasper, and covered by tracery as elaborate as Chinese carving. The floor slopes down from the vicinity of the pillars, while the roof gradually ascends until at a point perhaps 400 feet away, the distance between the dome above and the gulf below exceeds 200 feet ; and there a waterfall tumbles from an invisible source to the black pool that receives it into its bosom. And thus the little darkey, whose name even is unknown, found what was as marvellous as aught revealed by Aladdin's wonderful lamp, but found none to credit his fantastic tale.

Resuming now our exploration of the Main Cave, from which we have digressed, we find new objects commanding our attention as we advance. During a moment's pause we seem to hear the ticking of a musical clock. It is but the dripping of water in a hidden recess, measuring time as it doubtless has been doing for a thousand years. Near by is Wandering Willie's Spring, named for a blind boy who went wandering over the country with his violin. He wanted, as he said, "to see the cave for himself." Of course he lost his way ; and

when found by his companions, he was quietly sleeping by the limpid basin that has carried his name ever since.

Singular effects are produced by the devices of the guides. At a certain spot we are requested to stand still and extinguish our lamps for a few moments, while one of the guides burns magnesium at a point back of us. The result is a splendid view of the Grand Arch, and also of a remarkable shadow profile cast by the projecting buttresses. We are assured that it is an exact likeness of Martha Washington ; and there really is some resemblance to that "first lady of the land." When the lamps are re-lighted, we are also shown gigantic silhouettes made on the ceiling by incrustations of the black oxide of manganese. A whole menagerie is on exhibition, including a side-show of a giant and giantess playfully tossing papooses to and fro. We first ridicule these grotesque fancies, and then are fascinated by them. By the way, the etymology of the word "grotesque" is interesting ; it means, like what we find in grottoes, just as "picturesque" means, like what we see in pictures.

It is well to observe with care the large rock on the right that resembles a mighty sarcophagus. The Giant's Coffin is one of the most important land-marks in the cave. It equals in size one of the famous blocks of Baalbek, being forty feet long, twenty wide and eight or more deep. Often as I have passed it, whether alone or with a hundred companions, it has ever been with a feeling as if I had intruded into some sacred mausoleum.

At a point a hundred yards beyond the Giant's Coffin, the trend of the Main Cave turns upon itself at an acute angle on the left, and sweeps around in a magnifi-

cent amphitheatre on the right. A rude monument is here erected in memory of the gallant McPherson. More than 300 such piles have been reared in different parts of the cave, each tourist who chooses adding a stone. An incidental advantage of the custom is that it has helped to clear the paths.

The roofless remains of two stone cottages are next visited, as having a melancholy history. These and ten frame ones, now torn down, were built in 1843, for the use of fifteen consumptive patients, who took up their abode here, induced to do so by the uniformity of the temperature, and the oxygenated atmosphere, which has all the purity, without the rarity, of the air found in high altitudes. The second stone house was used as a dining-room; but all the rest were lodging-rooms and were well furnished and comfortable. Nine stood in this vicinity; but the remaining three were in other parts of the cave. This interesting experiment was thoroughly tried, but proved to be an utter failure; as did also the pitiful attempts of the poor invalids to make trees and shrubbery grow around their dismal huts.

A strangely beautiful transformation scene is exhibited in the Star Chamber, a hall several hundred feet long, about seventy feet wide, narrowing upward to a ceiling sixty feet above our heads. The gray walls are in contrast with the lofty black ceiling coated with the black oxide of manganese; and this again is studded with thousands of white spots, caused by the efflorescence of the sulphate of magnesia. The guide, in order to show off the chamber, seats us on log benches by the wall, takes all our lamps and vanishes behind a jutting rock; whence, by adroit manipulations, he

throws shadows flitting like clouds athwart the starry vault. The illusion is complete. The roof seems to have been lifted to an immense distance, and an imaginative person can easily be persuaded that he is actually gazing from a deep cañon up to the starry sky.

With an abrupt leave-taking the guide plunges into a gorge and we are left in utter darkness, and in silence so absolute that one can hear his own heart beat. While we question each other as to the meaning of this, we see in the distance a faint glimmer, like the first streak of dawn. It tinges the tips of the rocks, like the tops of hills far away. The horizon is bathed in a rosy glow, and we are prepared to see the sun rise, when the guide appears, swinging his cluster of lamps, and asking how we like the performance. Loudly encored, he repeats it—starlight, moonlight, thunder-clouds, midnight and day-dawn, the latter heralded by cock-crowing, the barking of dogs, lowing of cattle, and other barn-yard sounds, in which the ventriloquial guide is an adept.

Few visitors go further than this in the Main Cave, although it is well worth exploring to the very end. We pass along under a mottled ceiling that changes from a starry to a mackerel sky. We find many curious objects. There are snow-drifts of native Epsom salts whitening dusky ledges. There are ancient fire-places covered by broad slabs of limestone. There are numerous halls, mostly being enlargements of the general passage-way. Proctor's Arcade, Kinney's Arena, Wright's Rotunda, the Black Chambers, Solitary Chambers, the Cataracts, the Fairy Grotto, are all worthy of description. But we pass them by in order

to devote a little more space to what Bayard Taylor pronounced the grandest cavern room in the world. It is singularly designated as the Chief City. Taylor's estimate of its dimensions was "800 feet long, 300 feet broad, 125 feet high, and covering between four and five acres." It has just been accurately measured, and is 450 feet long, 130 wide, and covers one and one-third acres. But even this is an immense area, clothed as it is by eternal night, built in by walls of massive rock, and overarched by so vast a dome as to make us hold our breath, lest if silence were broken it would fall. Examination shows the arch to be one solid, seamless block of limestone that has doubtless been as it is now for thousands of years. Yet the ponderous rocks hurled about in the wildest confusion prove that mighty forces were once at play. All is quiet now, and the dust of ages rests on those huge blocks. Amid the interstices are bits of cane, such as the red men once used to fill with bear's fat and burn as torches, to light up their solemn councils, or to aid them in their search for hidden treasures of flint and alabaster. Bonfires used to be made of these cane-torches, which now have been really all destroyed or carried away. In lieu of them we burn red-fire and discharge rockets, which find room to explode before striking the distant walls. The dome seems to follow us as we retire, overarching us at every step, as we slowly withdraw from this pre-historic council-chamber of sagamores and dusky braves. The Main Cave has an average width of sixty feet throughout its entire length, and its height is rarely less than forty feet. No creeping nor crawling has to be done, although there is rough clambering at times.

Let us now return to the vicinity of the Saltpetre Works and explore the Gothic Avenue. At its junction with the Main Cave there is a noble amphitheatre with a narrow gallery sweeping across, and a rocky platform from which Edwin Booth once rendered selections from the play of Hamlet. Climbing a stairway we gain the highest cavern level, where everything is as dry as possible. Here, in a niche in the left hand wall, was long kept on exhibition the dried body of an aboriginal princess found by miners in a small cave in the vicinity. There were also a few genuine Mammoth Cave mummies, that were minutely described by Messrs. Gratz and Wilkins. These remains had not been embalmed, but were merely desiccated and kept from decay by the antiseptic properties of the nitrous earth.

In Register Hall guests are invited to leave their cards with the assurance that they will remain for years without mould or discoloration ; a statement to be taken with some allowance. There are in this part of the arcade various stalagmites and stalactites to which fanciful names have been given, such as the pillars of Cæsar, Pompey and Hercules, the Post Oak, the Elephant's Head, and the Old Arm Chair, in which it is said that Jenny Lind once sat and sang one of her sweet songs. Aside from the grotesque appearance of these gnarled and twisted columns, their most interesting feature is their extreme dryness. In one or two places I observed a few trickling drops ; but for the most part they were as dry as could possibly be. Hence they furnish no criterion whatever as to the age of the cavern. From certain other data it is concluded that Mammoth Cave and Niagara Falls were twins, both dating back to the Ter-

tiary Age. Water worn rocks are pointed out that show conclusively that an underground stream once swept through these halls, now so arid. But that must have been long ago. For the dust is often ankle deep, and when tossed into the air falls back like shot. So utterly free from moisture is it that not a particle of it will cling to the trailing robe nor stain the polished boot. Consequently the air is both chemically and optically pure, except as it may be made otherwise by our torches and fire-works.

Vulcan's Shop, the Lover's Leap, Lake Purity, Elbow Crevice, and Napoleon's Dome, are among the objects pointed out to us as we proceed to the end of this interesting avenue. On old maps of the cave a certain room used to be called the Haunted Chamber, on account of an adventure that befell one of the miners, a raw hand, who had trudged in here alone to dig his lot of "petre-dirt." He filled his sacks and started back, but lost his way, and to make matters worse stumbled over a stone and put his lamp out. Missing him at night-fall, his comrades hunted him up. When he saw them approaching, swinging their torches aloft and shouting, his excited imagination and his guilty conscience transformed them into so many devils, and he took to his heels crying lustily for mercy. It was with difficulty that the frightened wretch was brought back to his senses, and convinced that he was yet alive and in Mammoth Cave instead of in a worse place.

A more agreeable legend is linked with the Gothic Chapel and its charming Bridal Altar, where a Kentucky belle was wedded to a gallant young Southron, after having promised her mother not to marry any man on

the face of the earth. When taxed with having broken her vow she insisted that she had kept it to the very letter, and that it was not marrying any man on the face of the earth to be joined to her own true love in this subterranean Gretna Green.

The region of pits and domes is usually included in the Short Route, but for the sake of giving a more clear idea of the cavern in its continuity, we shall defer our description of it until, after an interval of rest at the hotel, we undertake the more extended trip to the farthest end of the cave.

Meanwhile, by way of an interesting digression, let us visit a locality half a mile from the hotel, and that has long been known as the White Cave, but which is probably only an arm of the Mammoth Cave. The entrance when first discovered was so narrow as to make ingress difficult ; but it has since been enlarged and is guarded by an iron gate. The first chamber has a rough and muddy floor, a low, flat and uneven roof, and is in shape an irregular oval. The second is considerably higher. Its floor is intersected by a number of crooked channels in which rills are constantly running, so transparent as to be almost invisible. There are many stalactites hanging from the ceiling, varying in size from a quill to a saw log. Among the finest specimens of dripstone are the Frozen Cascade, and a stately column named for the Baron von Humboldt. In a third and far larger chamber huge masses have fallen, encumbering the floor and making it certain that the passage-way has thus been blocked to rooms beyond. Around these ruins a wide canopy of alabaster has been drawn. The idea has long prevailed, which is un-

doubtedly correct, that a hidden avenue leads to the vicinity of the Crevice Pit in Mammoth Cave. Various attempts have accordingly been made to break through the mighty curtain in order to find the passage sought. Such a discovery would on many accounts be desirable, as it would enable tourists who enter one way to go out another, and also make accessible an exceedingly interesting suite of rooms.

A fact of great importance to palæontologists came to my knowledge during the preparation of this lecture, not new indeed, but that seems to have been forgotten even by scientists. Some seventy years ago, Mr. Clifford, a Kentuckian, exhumed from the floor of the White Cave a number of huge fossil bones that, after passing through several hands, finally came into the possession of the Academy of Natural Sciences at Philadelphia. Some of these bones were identified by Dr. Harlan as those of the bison, stag and bear; while others, in an excellent state of preservation, belonged to a young *Megalonyx*, of a different species from the one found by Thomas Jefferson in a cave in the Greenbrier valley in Virginia. Along with these bones of animals were found fragments of a human skeleton, though not necessarily of the same era. Indeed the remains of the bear alone seem to have been contemporaneous with those of the *Megalonyx*. Dr. Harlan's conclusion was that the latter was about as large as an ordinary ox, and had attained three-fourths its mature growth.

Resuming now our exploration of the Mammoth Cave, we prepare for the Long Route. As it requires an all-day tramp, servants accompany us with baskets of provisions in order to spread a lunch at a convenient

place beyond the rivers. Extra oil-flasks are also carried by the guides to replenish the lamps when necessary. Down we go again into the cave's dark mouth, under the thick horizontal plates of gray limestone, from whose green, mossy ledge falls the wild, pattering rill; and then advance for perhaps a mile amid some of the scenes already described.

On reaching the Giant's Coffin we leave the Main Cave by creeping through a crevice behind that huge monolith, and enter the Deserted Chambers. To our left, as we advance, is the opening to a long and serpentine avenue, or succession of avenues, that have been connected by the untiring energy and skill of Mr. H. C. Ganter, and made accessible to visitors. It has branches leading to huge domes and pits, a resounding waterfall and charming "floral" regions; but its chief interest lies in the fact that by this passage visitors may now reach safely portions of the cavern that were formerly unapproachable whenever the rivers were flooded, as they generally are in winter. This is really the most important and costly improvement made here for a long time, and in honor of the manager by whom this difficult engineering feat has been accomplished, it has been agreed to name the entire combination of passage-ways "Ganter's Avenue," which is certainly more attractive than the old name of "Black Snake" or the unmeaning one of "Welcome Avenue," both of which are to be henceforth discontinued.

Preferring the more frequented path, however, we turn to our right, instead of to the left, descend a steep stairway, and pause for a moment beside Richardson's Spring, visited by the Indians long before it was dis-

covered by white men. About 150 yards beyond the limpid spring yawns a chasm called from the peculiar shape of a projecting rock, the Side-Saddle Pit ; above which is Minerva's Dome. Descending by a sloping path to a lower level, fifty yards beyond, we enter the Labyrinth, where we presently find ourselves peering through a window-like aperture into profound darkness. The guide thrusts blazing rolls of oil-soaked paper through a similar window, thus disclosing indescribable wonders to our gaze. This is the famous Gorin's Dome. Its total depth is said to be 117 feet to its lowest point, while the height of the vault overhead seems to be fully 100 feet, making 217 feet the total altitude of this mighty chasm. The perpendicular walls are draped with stalagmitic curtains whose folds seem to be loosely floating but are really of solid stone. These hangings, dight with figures rare and fantastic, were woven in Nature's loom by crystal threads of running water. Putnam's and Hovey's cabinets are smaller domes, where concretions known as cave pearls are found. The Labyrinth ends in Ariadne's Grotto.

Retracing our way we next visit the profound abyss styled the Bottomless Pit, above which expands Shelby's Dome. It is a double pit, being nearly divided by a tongue of rock that juts into it for 27 feet or more, from whose point Stephen, the guide, in 1837, threw a ladder across and for the first time explored the regions beyond. A substantial bridge now spans the abyss. By line and plummet the depth is only 95 feet on one side and 105 on the other. Shelby's Dome overhead may be 65 feet, and the space between about 15 feet, making 180 feet the entire distance from top to bottom of the great chasm.

The treacherous Covered Pit had been known for ears, but no visitor ever crossed it until I did so, following William the guide. Once fairly beyond the loose slabs between which the black depths seemed to be lying in wait for the heedless explorer, we were on *terra incognita*. Creeping cautiously along, we presently discovered twin pits with a ridge but six feet wide between. These I named Scylla and Charybdis. Climbing down for a few feet into Scylla we found a ledge from which we lowered a lamp into the deepest part of the pit, getting a good view of the wrinkled and corrugated sides. At length the lamp caught on a projection—or more probably, as I now think, reached the bottom—and the cord was burned off, and what remained measured 135 feet. Mr. Ben Hains recently measured the Covered Pit, and found it to be but 47 feet deep. Pit No. 2 is 80 feet, and Pit No. 3 is 30 feet deep, with an aperture to a lower pit 59 feet deep, making 89 feet in all. Mr. Hains found Charybdis to be but 79 feet deep. Beyond the latter is the farther edge of the Bottomless Pit, opposite the crossing by bridge. While making my measurements a large fragment of limestone, dislodged by the guide, rolled past me and went thundering into one of the pits.

Returning as we came, we next pursued a narrow crevice that led us to a point near the bottom of the Bottomless Pit, whence we saw volumes of smoke emitted through an opening from Charybdis. This led me to suspect that all the pits thus singularly clustered together are really united with each other. The truth of this conjecture has since been confirmed by Mr. Hains' explorations. This gentleman entered an open-

ing from the room called "Great Relief," and following a serpentine passage for half a mile finally emerged into Charybdis. He found, as I had surmised, that seven or eight pits unite at the bottom to form a magnificent hall, that varies in width from 10 to 50 feet, and in height from 35 to 135 feet. The floor is very uneven, rising in high and pointed hills between the pits above. This new and vast apartment we have named, "Harrison's Hall," in honor of the President of the United States. The figures on following pages will aid to an understanding of its peculiarities.

Beyond the region of pits and domes, Mammoth Cave forks into two passages. That tending to the right is Pensico Avenue, a mile long, and exquisitely arched. It contains among its objects of interest a grotesque resemblance to a sea turtle, a large white column called, for some unknown reason, the Pine Apple Bush, the Hanging Grove, Wild Hall, Snowball Arch, Matt's Arcade, Angelica's Grot, and a remarkable place styled the Grand Crossing, where four avenues meet. Pensico Avenue runs back toward Green River, in a direction parallel to the Main Cave, suggesting a possible outlet.

Returning to the Reveller's Hall, we follow a low passage, four feet high, that ends in the Scotchman's Trap, a circular opening overhung by a ponderous slab that seems as if a careless breath might make it fall. A canny Scot came in thus far and refused to proceed lest he should be buried alive. Hence the name. But we dive under and go on. Next comes the Fat Man's Misery, a long, winding way that originally must have drained the region of pits, with walls 18 inches apart, the average height being but five feet, and that changes its direction

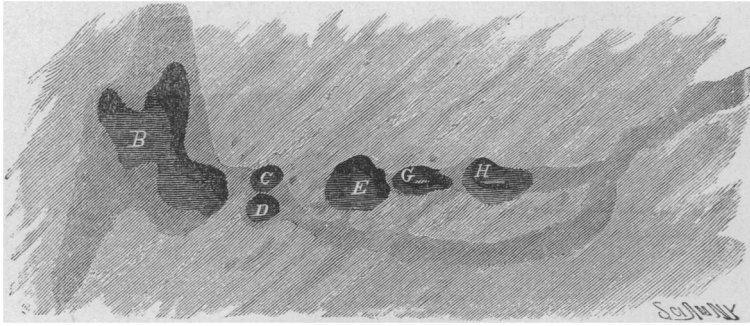


FIG. 1.

eight times in 236 feet. The sides are beautifully marked by waves and ripples, and polished by the friction applied by thousands of visitors. We straighten our spines in a room well named Great Relief, and then anxiously ask if there is any other way out than that twisted pass. The guide replies that we can go out by the Corkscrew, which, as we find on our return trial, is an intricate web of fissures conducting us up through a chaotic region, where we crawl through crevices and leap from rock to rock, for what would perhaps be a vertical distance of 150 feet, aided here and there by ladders, thus greatly shortening the trip. Those who come in one way generally go out the other, and regard the last way chosen the worst, whichever it may have been.

The Odd-Fellows' Links, Bacon Chamber, and a few other localities receive attention, and then the guide introduces us at once to River Hall, where are to be seen the most wonderful subterranean waters ever yet discovered. Only the faintest idea can be given of the gloomy wildness of this region. Our path first skirts the edge of cliffs sixty feet high and a hundred feet long, below which lie the sullen waters of the Dead Sea, whose

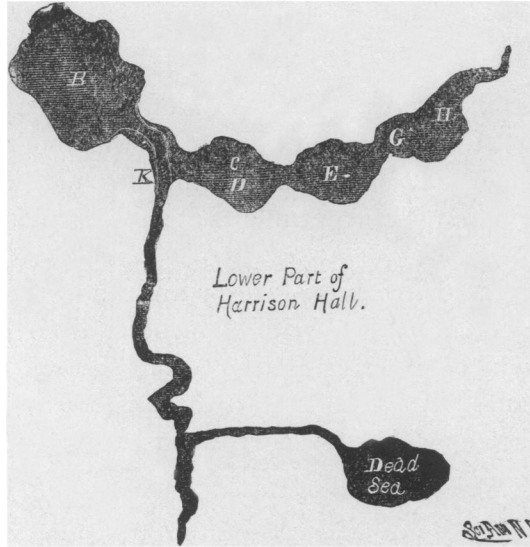


FIG. 2.

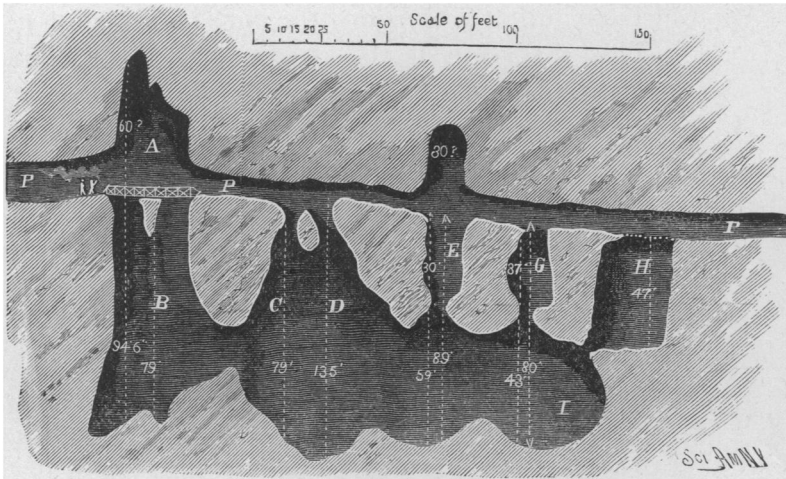


FIG. 3.

Explanation to cuts. Figure 1, Upper Orifices of the Pits. Figure 2, shows the horizontal Plan of the Hall. Figure 3, gives a Vertical Section. *A*, Shelby's Dome; *B*, Bottomless Pit; *C*, Charybdis; *D*, Scylla; *E*, Pit No. 3; *G*, Pit No. 2; *H*, Covered Pit; *I*, Sandstone Debris; *K* Lower Entrance to the Hall; *P*, General Pathway.

flavor is not saline, like its oriental namesake, but quite palatable. Descending a flight of steps, we proceed to the river Styx, diverging for a moment to see a cascade falling into a funnel-shaped hollow. It was in this vicinity that I found, in 1881, a natural mushroom bed, which led to some extensive experiments at subterranean mushroom farming.

The Styx used to have its ferry and its modern Cerberus ; but now a natural bridge has been discovered, by means of which we cross over to the shores of Lake Lethe. Each of these bodies of water is about 400 feet long and 40 feet wide. A narrow path runs along the margin of Lake Lethe, at the foot of cliffs 90 feet high, to a bridge at the neck of the lake. Our path next follows a winding and rippling stream, which sometimes flows out from and at others into the dark lake just mentioned. This reversion of the current has never been satisfactorily explained.

Four varieties of blind fish have thus far been discovered. None of them are very large, the average size being about two inches in length. The largest thus far caught was six inches long, and was bought of the guide for ten dollars by a snob, who proudly had the costly fish served for his breakfast the next morning ! These tiny fish are colorless, have cartilage instead of bones, are viviparous, and are so sensitive that if a grain of sand should fall on the water, they will dart away with rapidity. Blind crawfish are also found here, whitish, semi-transparent, with remarkably long antennæ and more delicate in every way than those found in outside streams. These also are highly sensitive and not easily captured. The total list of cavern fauna is not very great, after ex-

cluding animals known to be accidental visitors. Making allowance for synonyms, we find no more than one hundred species in all. Yet insignificant as they seem to the careless eye, they have received abundant attention from scientific men, and names big enough for whales and mastodons, instead of crickets, spiders, flies, fleas, worms and minnows.

The food supply of cave animals is scanty. Most of them are scavengers, subsisting on decaying wood, dead leaves, etc., swept in by the waters, or on relics left by human visitors. Cave spiders spin webs to catch cave flies, as is done in the upper air. Blind fish live on blind crawfish, when they can catch them, and these in turn extract smaller crustacea with their claws from under the flat stones where they hide. Aquatic plants here are not green, like their open water congeners, but are pellucid and bleached. Indeed the law is universal that all true cave fauna and flora are either without color or nearly white. There is a striking similarity between the deep-sea animals and those found in caves. The whole subject is profoundly interesting from its lessons as to the retardation and development of life ; but those wishing to pursue this line further are referred to the publications of Telkamp, Dekay, Packard, Cope, Putnam, S. I. Smith, and others.

There are several other subterranean streams besides those already mentioned. But we shall only describe our exploration of the famous Echo River. This is a body of water varying in width from 20 to 200 feet, and estimated to be three-quarters of a mile in length. Its depth, at ordinary stages of the water, is from 10 to 40 feet, and the roof rises above the surface to a corre-

sponding height. A flotilla of uncouth little flat-boats is kept on the river, some at one end and the remainder at the other, the materials for which were all brought in through the Fat Man's Misery, being afterwards put together. It is a fine spectacle to see eight or ten boats, each carrying from ten to twenty passengers, with an ample supply of lamps, and an occasional discharge of fireworks, following each other, their crews meanwhile tempting the marvellous echoes by shout, scream and song ; laughter, whispers and yells ; rattling pistol shots, flute solos and bright arpeggios on the cornet—all of which are faithfully reproduced, though occasionally with remarkable variations. The long vault has also a certain key-note of its own which, when firmly struck, excites harmonics of incredible depth and sweetness.

Last summer, in company with a party of four, no others being on the river at the time, we tried the effect of rocking the boat as violently as we dared to do, also striking the edge and the surface of the water with our paddles, and in other ways making as much agitation of the body of the stream as possible, and then awaiting the result in silence. I timed the concert thus created, and found its duration to be exactly half-an-hour ! First came sounds like the tinkling of silver bells. Then larger and heavier bells took up the melody as the waves sought out the cavities in the walls. Then it was as if all chimes of all cathedrals had conspired to raise a tempest of sweet sounds. For a moment there was utter silence, soon broken by low mutterings, ghostly whispers, sudden shrieks, as if of men in agony. Then silence again. We were about to speak, when the guide motioned to us to remain quiet. When, lo ! as from

some deep recess, hitherto forgotten, came a tone tender and profound ; after which, like gentle memories, all the mellow and mysterious sounds that had gone before were re-awakened until river hall rang again with the wondrous harmony.

A rocky inlet receives our craft as we land at Cascade Hall. We tread a pathway of solid stone leading through Silliman's Avenue. We climb cliffs, or dive under hanging rocks, or step aside to explore an attractive arcade, or a snow-drift of fibrous gypsum, as the case may be. We note the successive tiers, or galleries, showing how the cavern floor, from age to age, has dropped down to its present level.

El Ghor, which is but a continuation of the same avenue, contains many interesting objects, conveying valuable lessons in mineralogy and geology. Rhoda's Arcade, on our left, leads to Lucy's Dome, which I regard as the most symmetrical and lofty dome in the cave. Corinna's Dome rests directly over El Ghor, while Stella's Dome is reached by a narrow crevice further on. El Ghor is said to lead to a stream known as the Mystic River, though I have not yet verified this statement. Visitors usually leave the gorge at a small basin called Hebe's Spring, by climbing a ladder one at a time and going through a hole in the roof, to an upper tier, where they find themselves in a stony vineyard. Nodules and globules simulate clusters on clusters of luscious grapes, burdening hundreds of boughs, and gleaming with party-colored tints through the dripping dew.

Washington Hall is but a smoke-stained lunch-room, strewn with relics of hundreds, and possibly thousands of dining-parties, while along its walls are fragments of

bottles, rusty tin cans, and other reliquiæ of underground feasts. While we dine, the guides fill the lamps from oil-cans kept here for the purpose. The ceiling of the Snow-ball room is dotted with hemispherical masses of snowy gypsum. Marion Avenue has two branches, one leading to Zoe's Grotto, and the other to Paradise, Portia's Parterre and Digby's Dome. These are highly interesting localities, but are not on the regular route, which, as we follow it, takes us next to that very treasure-house of alabaster brilliants, named for the mineralogist, Cleveland's cabinet.

Imagine a series of arches of 50 feet span, where there is a mimicry of every flower from the modest violet to the flaunting helianthus. Examine any one of these cave flowers—the “oulopholites” of the mineralogist. From a central stem gracefully curl countless crystals, fibrous and pellucid; each crystal a study; each fascicle of curved prisms wonderful; and the whole blossom a miracle of beauty. Multiply this mimic flower from one to a hundred, a thousand, a myriad. Move down the dazzling vista, as if in a dream of Elysium—not for a few yards, or rods only, but for one or two miles! All is virgin white, except here and there a patch of gray limestone, or a spot bronzed by some metallic stain, or as we purposely vary the lovely monotony by burning colored lights. Midway is a great floral cross overhead. Clusters, wreaths, garlands embellish nearly every foot of the ceiling and walls. The very soil sparkles with trodden jewels. I picked up one of these gems, and had it magnified five hundred times and then photographed, merely to show how absolutely perfect it is. The fancy finds every flower of the green-house or parterre in this crys-

talline conservatory. Sprays of asters, drooping fuchsias, spikes of tuberoses, wax-leaved magnolias, blanched tulips—but why try to exhaust the botanical catalogue? They are all here, and patient search will find them, every one.

Charlotte's Grotto is the crowning glory of this fairy-like region. I had often heard it extolled, but never having seen it in any of my trips, I made particular inquiry. No one seemed to know anything about it. Finally, on hearing a comely colored matron at the hotel addressed as "Aunt Charlotte," I sought information from her concerning the locality bearing her name. She told me that the grotto was named for her by Stephen Bishop, her former husband. Her nephew piloted me to the spot, where I found all the wonders that had been so graphically described by Professor Locke, Bayard Taylor and other early visitors. There the pendulous fringes of the night-blooming cereus are rivalled by snowy plumes floating from rifts forever safe from the withering glare of daylight; and thanks to the convenient forgetfulness of the guides these marvels have been thus far kept from spoliation by thieving curiosity-hunters.

Beyond the fairyland the cave divides into three branches. That on the right leads to the Sandstone Dome. The middle branch is Franklin Avenue. We followed the left-hand path, over the Rocky Mountains (100 feet high) and on to Croghan's Hall, the end of the Long Route. Here is also the Maelstrom, a pit said to be 175 feet deep. Into this abyss Mr. W. C. Prentice descended by a rope, some years ago, and met with various thrilling adventures that have been done into verse by Rev. George Lansing Taylor. It is related of Dr. John

Croghan, for whom the above-mentioned hall is named, that during his foreign travels he was continually inquired of about Mammoth Cave ; and when obliged to confess that, although a Kentuckian, he had never seen the greatest wonder of his State, it so mortified him that, on returning home, he paid the cavern an immediate visit. Shortly afterwards he bought it, and devoted much time and money to the development of the property. At his death he left it to his nephews and nieces, by whom it is still owned, though under the exclusive management of their agent, Mr. H. C. Ganter.

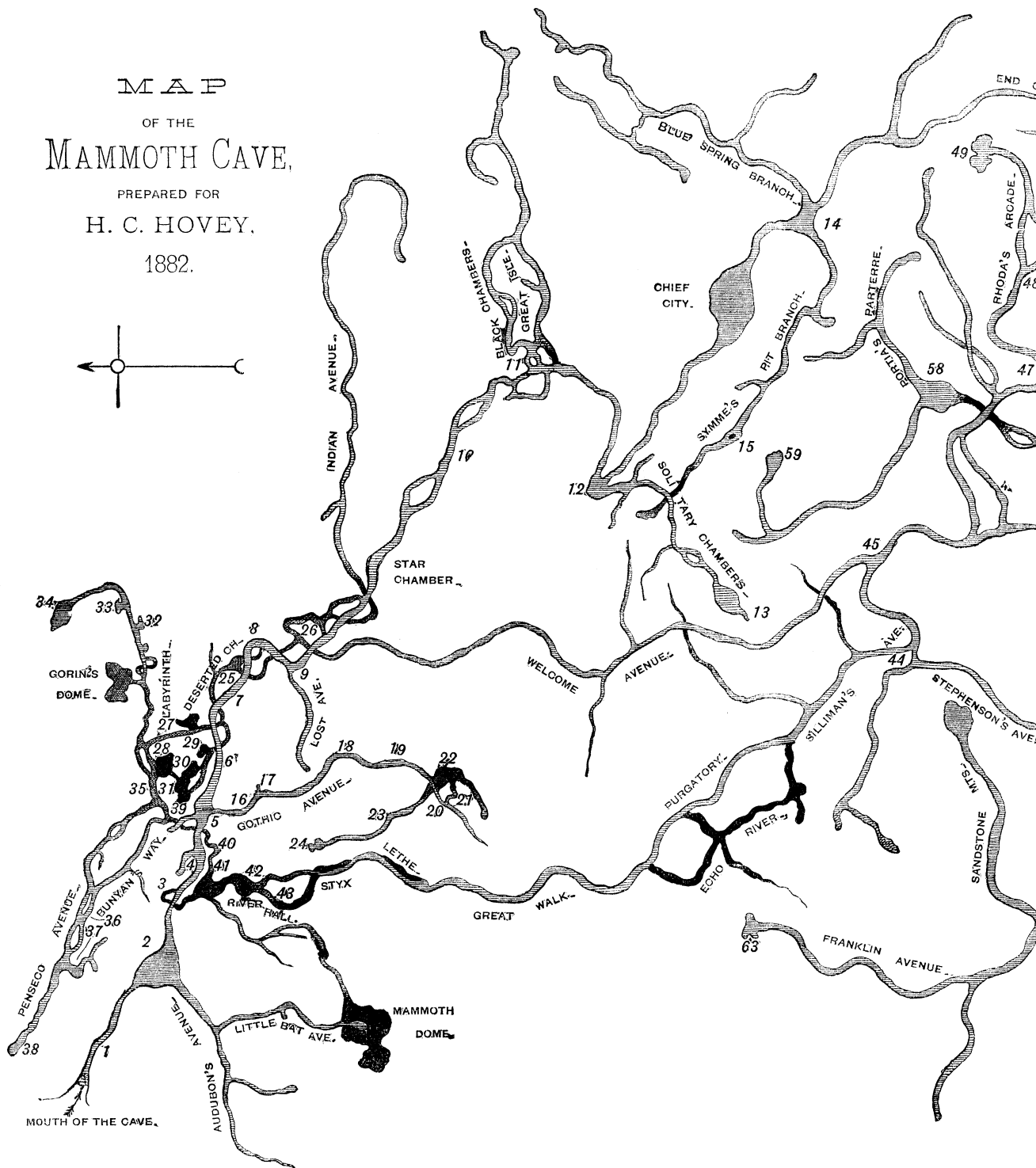
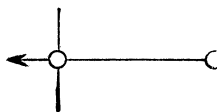
In this condensed description but a few of the many rooms and avenues catalogued have been even mentioned. Prof. D. D. Owen says that 225 halls and passages have been explored and named, and that the chemical and mechanical action of water have here displaced twelve million cubic yards of limestone !

Visitors usually rest for a while on the rustic seats near the entrance before climbing the hill to the hotel. Here the inner and outer atmospheres mingle. By contrast with the pure, oxygenated air of the cave, the odors of the outside world, of the trees, grass, weeds and flowers, is strangely intensified, and for many delicate natures overpowering. The guides tell us that, in accomplishing the long and short routes we have journeyed more than twenty miles under ground. They assured me that in my tramping in and out on repeated visits, I had travelled more than 200 miles. None of us feel like disputing such assertions. We are satisfied—satiated. Though gaining less definite knowledge than might be desired, we have had a surfeit of adventures, conjectures, guesses and mysteries. Feelings akin to friendship have

sprung up within us, however, for grand old Mammoth Cave. And it is with positive regret that we finally turn away for the last time from the fern-fringed chasm lying there in the soft moonlight, where the sparkling cascade throws pearly drops from the mossy ridge, and spreads its mist like a silver veil.

MAP OF THE MAMMOTH CAVE,

PREPARED FOR
H. C. HOVEY.
1882.



MAIN CAVE.

1. The Iron Gate.
2. The Rotunda.
3. Kentucky Cliffs and the Corkscrew.
4. The Methodist Church.
5. Gothic Galleries.
6. Standing Rocks.
7. Grand Arch.
8. Giant's Coffin.
9. Acute Angle, and Cottages.
10. Proctor's Arcade.
11. Wright's Rotunda.
12. The Cataracts.
13. Fairy Grotto.
14. St. Catherine's City.
15. Symmes' Pit.

GOTHIC AVENUE.

16. Seat of the Mummy.
17. Register Hall.
18. Gothic Chapel.
19. The Arm Chair.
20. Lover's Leap.
21. Elbow Crevice.
22. Napoleon's Dome.
23. Lake Purity.
24. Annette's Dome.

DESERTED CHAMBERS.

25. Wooden Bowl Room.
26. Black Snake Avenue.
27. Side-Saddle Pit.

28. Bottomless Pit.
29. Covered Pit.
30. Scylla.
31. Charybdis.

LABYRINTH.

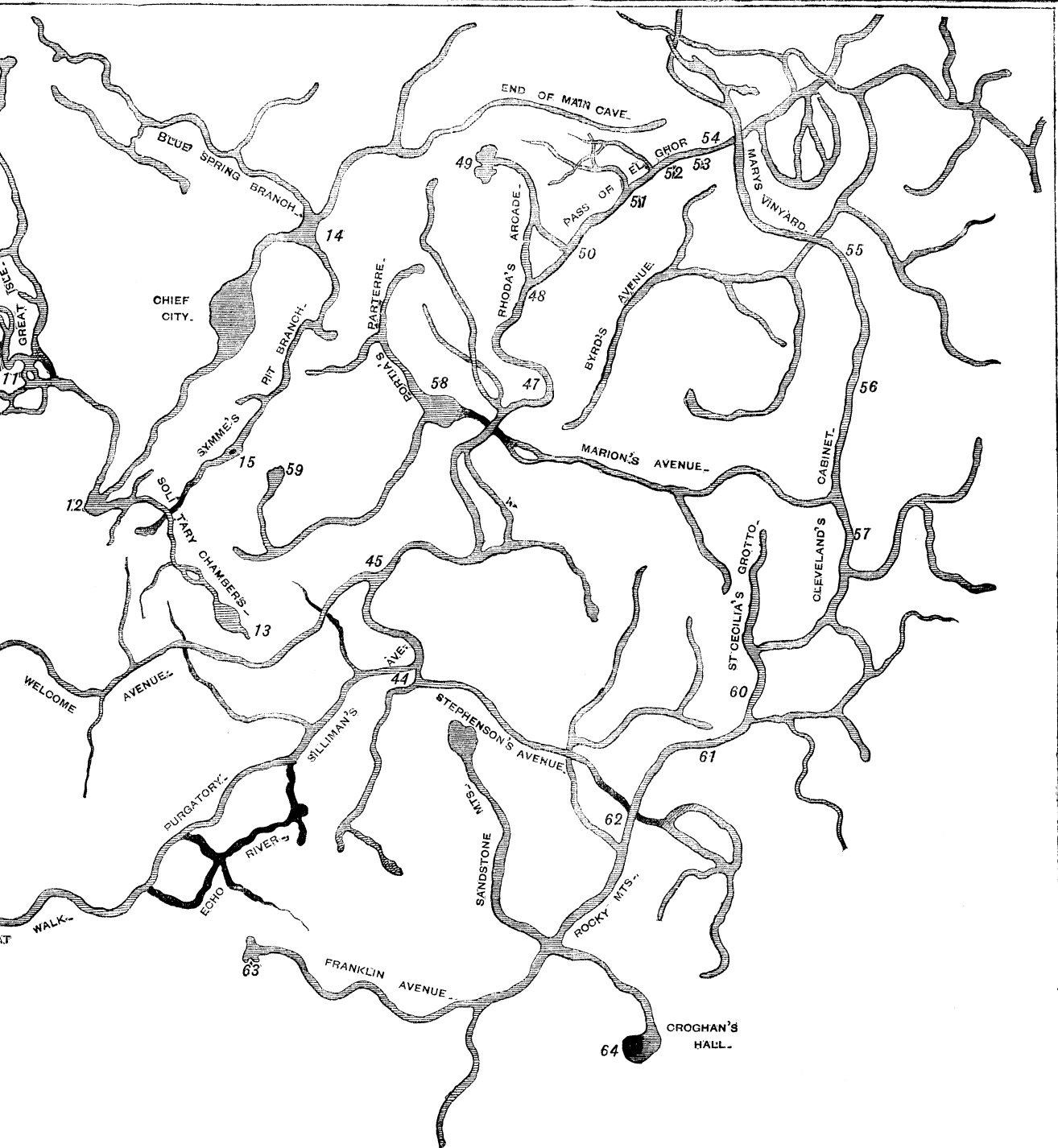
32. Putnam's Cabinet.
33. Hovey's Cabinet.
34. Ariadne's Grotto.

PENSICO AVENUE.

35. Revelers' Hall.
36. Grand Crossing.
37. Pineapple Bush.
38. Angelica's Grotto.

ON THE

39. Scotchman's Hall.
40. Fat Man's Hall.
41. Great Relief.
42. The Dead Sea.
43. Cascade at the Mouth.
44. Cascade at the Mouth.
45. Serpent Hall.
46. Valley-Way.
47. Great West.
48. Valley of the Moon.
49. Lucy's Dome.
50. Ole Bull's Grotto.
51. Fly Chamber.
52. Sheep Shelter.



Bogart, C. M. Co.

E.

- 28. Bottomless Pit.
- 29. Covered Pit.
- 30. Seylla.
- 31. Charybdis.

LABYRINTH.

- 32. Putnam's Cabinet.
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- 34. Ariadne's Grotto.

PENSICO AVENUE.

- 35. Revelers' Hall.
- 36. Grand Crossing.
- 37. Pineapple Bush.
- 38. Angelica's Grotto.

ERS.

ON THE LONG ROUTE.

- 39. Scotchman's Trap.
- 40. Fat Man's Misery.
- 41. Great Relief.
- 42. The Dead Sea.
- 43. Cascade at the Styx.
- 44. Cascade Hall.
- 45. Serpent Hall.
- 46. Valley-Way Side-Cut.
- 47. Great Western.
- 48. Valley of Flowers.
- 49. Lucy's Dome.
- 50. Ole Bull's Concert Hall.
- 51. Fly Chamber.
- 52. Sheep Shelter.

- 53. Corinna's Dome.
- 54. Black Hole of Calcutta.
- 55. Washington Hall.
- 56. Snow Ball Room.
- 57. Floral Cross and Last Rose of Summer.
- 58. Paradise.
- 59. Zoe's Grotto.
- 60. Flora's Garden.
- 61. Vale of Diamonds.
- 62. Charlotte's Grotto.
- 63. Serena's Arbor.
- 64. The Maelstrom.